What is claimed is:

1. An apparatus for the automated solid-phase synthesis of oligosaccharides, comprising:

a reaction vessel containing at least one insoluble resin bead;

at least one donor vessel containing a saccharide donor solution;

at least one activator vessel containing an activating reagent solution;

at least one deblocking vessel containing a deblocking reagent solution;

at least one solvent vessel containing a solvent;

a solution transfer system capable of transferring the saccharide donor solution, activating reagent solution, deblocking reagent solution, and solvent; and

a computer for controlling the solution transfer system.

2. The apparatus of claim 1, wherein the at least one insoluble resin bead has a glycosyl acceptor tethered to the resin bead via an organic linker.

3. The apparatus of claim 1, further comprising a temperature control unit for regulating the temperature of the reaction vessel.

4. The apparatus of claim 3, wherein the temperature control unit is controlled by the computer.

5. The apparatus of claim 3, wherein the temperature control unit measures the internal temperature of the reaction vessel.

6. The apparatus of claim 3, wherein the reaction vessel is a double-wall structure forming two cavities, wherein the first cavity accommodates the synthesis of oligosaccharides, and wherein the second cavity accommodates a coolant of the temperature control unit.

7. The apparatus of claim 6, wherein the double-wall structure of the reaction vessel is comprised of glass.

8. The apparatus of claim 3, wherein the temperature control unit is capable of maintaining the reaction vessel at a temperature of between -80C and +60C.

9. The apparatus of claim 3, wherein the temperature control unit is capable of maintaining the reaction vessel at a temperature of between -25C and +40C.

10. The apparatus of claim 1, wherein the at least one donor vessel contains a solution comprising a glycosyl trichloroacetimidate.

11. The apparatus of claim 1, wherein the at least one donor vessel contains a solution comprising a glycosyl phosphate.

12. The apparatus of claim 1, wherein the at least one activator vessel contains a solution comprising a Lewis acid.

13. The apparatus of claim 12, wherein the at least one activator vessel contains a solution comprising a silyl trifluoromethanesulfonate.

14. The apparatus of claim 12, wherein the at least one activator vessel contains a solution comprising trimethylsilyl trifluoromethanesulfonate.

15. The apparatus of claim 1, wherein the at least one deblocking vessel contains a solution comprising sodium methoxide.

16. The apparatus of claim 1, wherein the at least one deblocking vessel contains a solution comprising hydrazine.

17. The apparatus of claim 1, wherein the at least one solvent vessel contains dichloromethane.

18. The apparatus of claim 1, wherein the at least one solvent vessel contains tetrahydrofuran.

19. The apparatus of claim 1, wherein the at least one solvent vessel contains methanol.

20. The apparatus of claim 2, wherein the at least one donor vessel contains a solution comprising a glycosyl trichloroacetimidate, the at least one activator vessel contains a solution comprising trimethylsilyl trifluoromethanesulfonate, the at least one deblocking vessel contains a solution comprising sodium methoxide, a first solvent vessel contains dichloromethane, a second solvent vessel contains methanol, and a third solvent vessel contains tetrahydrofuran.

21. The apparatus of claim 2, wherein the at least one donor vessel contains a solution comprising a glycosyl phosphate, the at least one activator vessel contains a solution comprising

trimethylsilyl trifluoromethanesulfonate, the at least one deblocking vessel contains a solution comprising sodium methoxide, a first solvent vessel contains dichloromethane, a second solvent vessel contains methanol, and a third solvent vessel contains tetrahydrofuran.

22. The apparatus of claim 1, further comprising at least one blocking vessel containing a blocking reagent solution.

23. The apparatus of claim 22, wherein the at least one blocking vessel contains a solution comprising benzyl trichloroacetimidate.

24. The apparatus of claim 22, wherein the at least one blocking vessel contains a solution comprising a carboxylic acid.

25. The apparatus of claim 24, wherein the carboxylic acid is levulinic acid.

26. The apparatus of claim 22, further comprising a temperature control unit for regulating the temperature of the reaction vessel, and wherein the at least one insoluble resin bead has a glycosyl acceptor tethered to the resin bead via an organic linker.

27. The apparatus of claim 26, wherein the at least one blocking vessel contains a solution comprising levulinic acid, the at least one donor vessel contains a solution comprising a glycosyl phosphate donor, the at least one activator vessel contains a solution comprising trimethylsilyl trifluoromethanesulfonate, the at least one deblocking vessel contains a solution comprising hydrazine, a first solvent vessel contains dichloromethane, a second solvent vessel contains methanol, and a third solvent vessel contains tetrahydrofuran, a fourth solvent vessel contains a solution comprising pyridine and acetic acid, and a fifth solvent vessel contains a 0.2 M solution of acetic acid in tetrahydrofuran.

28. The apparatus of claim 26, wherein the at least one blocking vessel contains a solution comprising levulinic acid, a first donor vessel contains a solution comprising a glycosyl trichloroacetimidate, a second donor vessel contains a solution comprising a first glycosyl phosphate, a third donor vessel contains a solution comprising a second glycosyl phosphate, the at least one activator vessel contains a solution comprising trimethylsilyl trifluoromethanesulfonate, a first deblocking vessel contains a solution comprising hydrazine, a second deblocking vessel contains a solution comprising sodium methoxide, a first solvent vessel contains dichloromethane, a second solvent vessel contains methanol, and a third solvent vessel

contains tetrahydrofuran, a fourth solvent vessel contains a solution comprising pyridine and acetic acid, and a fifth solvent vessel contains a 0.2 M solution of acetic acid in tetrahydrofuran.

29. The apparatus of claim 1, wherein the at least one insoluble resin bead is comprised of an octenediol functionalized resin.

30. The apparatus of claim 2, wherein the organic linker is comprised of a glycosyl phosphate.

31. A method of forming a carbon-heteroatom bond between a glycosyl donor and a substrate, comprising the step of combining in solution, in the reaction vessel of an apparatus of claim 1, a glycosyl donor comprising a reactive anomeric carbon, a substrate comprising a heteroatom bearing a hydrogen, and an activating reagent, wherein said activating reagent activates said reactive anomeric carbon of said glycosyl donor, thereby forming a product comprising a carbon-heteroatom bond between said anomeric carbon of said glycosyl donor and said heteroatom of said substrate.

32. The method claim 31, wherein said glycosyl donor comprising a reactive anomeric carbon is selected from the group consisting of glycosyl phosphates, glycosyl phosphites, glycosyl trichloroacetimidates, glycosyl halides, glycosyl sulfides, glycosyl sulfoxides, n-pentenyl glycosides, and 1,2-anhydroglycosides.

33. The method claim 31, wherein said glycosyl donor comprising a reactive anomeric carbon is selected from the group consisting of glycosyl phosphates and glycosyl trichloroacetimidates.

34. The method of claim 31, wherein said heteroatom bearing a hydrogen of said substrate is selected from the group consisting of oxygen, nitrogen, and sulfur.

35. The method of claim 31, wherein said heteroatom bearing a hydrogen of said substrate is selected from the group consisting of oxygen and nitrogen.

36. The method of claim 31, wherein said heteroatom bearing a hydrogen of said substrate is oxygen.

37. The method of claim 31, wherein said activating reagent is a Lewis acid.

38. The method of claim 31, wherein said activating reagent is a silyl trifluoromethanesulfonate.

39. The method of claim 31, wherein said activating reagent is trimethylsilyl trifluoromethanesulfonate.

40. The method of claim 31, wherein said glycosyl donor comprising a reactive anomeric carbon is selected from the group consisting of glycosyl phosphates, glycosyl phosphites, glycosyl trichloroacetimidates, glycosyl halides, glycosyl sulfides, glycosyl sulfoxides, n-pentenyl glycosides, and 1,2-anhydroglycosides; said heteroatom bearing a hydrogen of said substrate is selected from the group consisting of oxygen, nitrogen, and sulfur; and said activating reagent is a Lewis acid.

41. The method of claim 31, wherein said glycosyl donor comprising a reactive anomeric carbon is selected from the group consisting of glycosyl phosphates and glycosyl trichloroacetimidates; said heteroatom bearing a hydrogen of said substrate is selected from the group consisting of oxygen, nitrogen, and sulfur; and said activating reagent is a silyl trifluoromethanesulfonate.

42. The method of claim 31, wherein said glycosyl donor comprising a reactive anomeric carbon is selected from the group consisting of glycosyl phosphates and glycosyl trichloroacetimidates; said heteroatom bearing a hydrogen of said substrate is selected from the group consisting of oxygen, nitrogen, and sulfur; and said activating reagent is trimethylsilyl trifluoromethanesulfonate.

43. The method of claim 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, or 42, wherein said substrate comprising a heteroatom bearing a hydrogen is tethered to a solid support via a covalent linker.

44. The method of claim 43, wherein said covalent linker is -O-$(CH_2)_3CH=CH(CH_2)_3$-O-.

45. The method of claim 44, wherein said solid support is a resin bead.

46. The method of claim 45, wherein said substrate comprising a heteroatom bearing a hydrogen is selected from the group consisting of monosaccharides, oligosaccharides, polysaccharides, and glycoconjugates.

47. The method of claim 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, or 42, wherein said glycosyl donor comprising a reactive anomeric carbon is tethered to a solid support via a covalent linker.

48. The method of claim 47, wherein said covalent linker is -O-$(CH_2)_3CH=CH(CH_2)_3$-O-.

49. The method of claim 48, wherein said solid support is a resin bead.

50. The method of claim 49, wherein said substrate comprising a heteroatom bearing a hydrogen is selected from the group consisting of monosaccharides, oligosaccharides, polysaccharides, and glycoconjugates.

51. The method of claim 43, further comprising the steps of applying positive pressure or a vacuum to said reaction vessel of said apparatus, thereby removing the liquid phase from said reaction vessel of said apparatus; and adding solvent to said reaction vessel of said apparatus.

52. The method of claim 47, further comprising the steps of applying positive pressure or a vacuum to said reaction vessel of said apparatus, thereby removing the liquid phase from said reaction vessel of said apparatus; and adding solvent to said reaction vessel of said apparatus.

53. The method of claim 51, further comprising the steps of applying positive pressure or a vacuum to said reaction vessel of said apparatus, thereby removing the liquid phase from said reaction vessel of said apparatus; and adding solvent to said reaction vessel of said apparatus.

54. The method of claim 52, further comprising the steps of applying positive pressure or a vacuum to said reaction vessel of said apparatus, thereby removing the liquid phase from said reaction vessel of said apparatus; and adding solvent to said reaction vessel of said apparatus.

55. The method of claim 51, further comprising the step of treating said product, in said reaction vessel of said apparatus, with a solution comprising a deprotection reagent, thereby removing from said product a protecting group to produce a second product comprising a heteroatom bearing a hydrogen, wherein said second product is tethered to a solid support via a covalent linker.

56. The method of claim 55, further comprising the step of combining in solution, in said reaction vessel of said apparatus, a glycosyl donor comprising a reactive anomeric carbon, said second product comprising a heteroatom bearing a hydrogen, and an activating reagent, wherein said activating reagent activates said reactive anomeric carbon of said glycosyl donor, thereby

forming a third product comprising a carbon-heteroatom bond between said anomeric carbon of said glycosyl donor and said heteroatom of said second product, wherein said third product is tethered to a solid support via a covalent linker.

57. The method of claim 52, further comprising the step of treating said product, in said reaction vessel of said apparatus, with a solution comprising a converting reagent to produce a second product comprising a reactive anomeric carbon, wherein said second product is tethered to a solid support via a covalent linker.

58. The method of claim 57, further comprising the step of combining in solution, in said reaction vessel of said apparatus, a substrate comprising a heteroatom bearing a hydrogen, said second product comprising a reactive anomeric carbon, and an activating reagent, wherein said activating reagent activates said reactive anomeric carbon of said second product, thereby forming a third product comprising a carbon-heteroatom bond between said anomeric carbon of said second product and said heteroatom of said substrate, wherein said third product is tethered to a solid support via a covalent linker.